Claims

1. A method for the correction of a substantially linear distortion with twofold symmetry in an extra-axial field region of an image plane of a projection lens that is non-telecentric on the object side and that is part of a microlithographic projection exposure apparatus, with which a pattern contained in a reticle can be imaged on a substrate of a light-sensitive layer while the reticle is traversed relative the projection lens along a scan direction at a first relative velocity, comprising the step of tilting the reticle for the correction of the distortion about a tilt axis that is disposed at least approximately perpendicular to an optical axis of the projection lens and to the scan direction.

2. The method according to Claim 1, wherein a wafer is traversed along the scan direction relative to the projection lens at a second relative velocity, the ratio of the first traversing velocity to the second traversing velocity being predetermined by the linear magnification of the projection lens.

3. The method according to Claim 1, wherein the tilt axis extends through a region of the reticle that is exposed to projection light.

4. The method according to Claim 3, wherein the tilt axis extends through the middle of the region that is exposed to projection light.

5. The method according to Claim 2, wherein additionally the wafer is tilted about a further tilt axis that extends parallel to the tilt axis about which the reticle is tilted.

6. The method according to Claim 5, wherein the reticle and the wafer are tilted about tilt angles, the ratio of which is, in terms of magnitude, substantially equal to the linear magnification of the projection lens.

7. The method according to Claim 5, wherein the tilt axes about which the reticle and the wafer are tilted have spacings from the optical axis, the ratio of which is, in terms of magnitude, substantially equal to the linear magnification of the projection lens.

8. The method according to Claim 1, wherein the substrate is displaced in the image plane for the correction of a field-constant portion of the distortion.

9. The method according to Claim 1, wherein additionally at least one optical element of the projection lens is changed in its spatial position.

10. The method according to Claim 9, wherein the at least one optical element is displaced parallel to the optical axis.

11. The method according to Claim 9, wherein the at least one optical element is displaced translationally in a plane perpendicular to the optical axis.

12. The method according to Claim 9, wherein the at least one optical element is displaced in the scan direction.

13. The method according to Claim 9, wherein the at least one optical element is displaced perpendicular to the scan direction.

14. The method according to Claim 9, wherein the at least one optical element is tilted about a tilt axis that is disposed at least approximately perpendicular to the optical axis of the projection lens and to the scan direction.

15. The method according to Claim 9, wherein the at least one optical element is tilted about a tilt axis that is disposed at least approximately perpendicular to the optical axis of the projection lens and parallel to the scan direction.

16. The method according to Claim 1, wherein additionally the linear magnification of the projection lens is changed.

17. The method according to Claim 1, wherein the projection lens exclusively has mirrors as imaging optical elements.

18. The method according to Claim 17, wherein the projection lens has at least four mirrors.

19. A method for the correction of a substantially antisymmetric quadratic distortion in an extra-axial field region of an image plane of a projection lens that is part of a microlithographic projection exposure apparatus, with which a pattern contained in a reticle can be imaged on a

substrate of a light-sensitive layer, comprising the step of rotating the reticle, the substrate or both for the correction of the distortion about an axis of rotation that is disposed at least approximately parallel to an optical axis of the projection lens.

20. The method according to Claim 19, wherein the axis of rotation extends through the extra-axial field region.

21. The method according to Claim 20, wherein the axis of rotation lies in a plane of symmetry of the projection lens in which the optical axis also extends.

22. The method according to Claim 19, wherein for the correction of a field-constant portion of the distortion the substrate is displaced in the image plane.

23. The method according to Claim 19, wherein additionally at least one optical element of the projection lens is changed in its spatial position.

24. The method according to Claim 23, wherein the at least one optical element is displaced parallel to the optical axis.

25. The method according to Claim 23, wherein the at least one optical element is displaced translationally in a plane perpendicular to the optical axis.

26. The method according to Claim 23, wherein the at least one optical element is displaced in the scan direction.

27. The method according to Claim 23, wherein the at least one optical element is displaced perpendicular to the scan direction.

28. The method according to Claim 23, wherein the at least one optical element is tilted about a tilt axis that is disposed at least approximately perpendicular to the optical axis of the projection lens and to the scan direction.

29. The method according to Claim 23, wherein the at least one optical element is tilted about a tilt axis that is disposed at least approximately perpendicular to the optical axis of the projection lens and parallel to the scan direction.

30. The method according to Claim 19, wherein additionally the linear magnification of the projection lens is changed.

31. The method according to Claim 19, wherein the projection lens exclusively has mirrors by way of imaging optical elements.

32. The method according to Claim 31, wherein the projection lens has at least four mirrors.

33. A method for the microlithographic production of microstructured components, comprising the following steps:

a) providing a substrate onto which a layer of a light-sensitive material is applied at least partially;

b) providing a reticle that contains structures to be imaged;

c) providing a projection exposure apparatus with a projection lens;

d) correction of a distortion of the projection lens in accordance with the method as specified in Claim 1 or as specified in Claim 19;

e) projecting at least a part of the reticle onto a region on the layer with the aid of the projection exposure apparatus.

34. A microstructured component that is produced by a method according to Claim 33.

35. A projection lens of a microlithographic projection exposure apparatus with a manipulator with which for the correction of a substantially antisymmetric quadratic distortion a reticle, a substrate or both is/are capable of being rotated about an axis of rotation that is disposed at least approximately parallel to an optical axis of the projection lens, the ratio of the correction of the distortion to the angle of rotation generated by the manipulator being greater than 1.5 nm/µrad.